

We claim:

1 1. A method of scheduling central processing unit (CPU) usage by a given task  
2 comprising:

3 associating said given task with a top level class and a sub-class; and

4 determining a target CPU usage for said given task from a weight associated  
5 with said sub-class and a target CPU usage associated with said top level  
6 class.

1 2. The method of claim 1 further comprising:

2 determining an actual usage of said CPU by said given task in a first  
3 predetermined evaluation interval;

4 determining a penalty duration for said given task based on said actual  
5 usage and said target CPU usage for said given task; and

6 applying a penalty to said given task for said penalty duration during a  
7 second predetermined evaluation interval.

1 3. The method of claim 2 wherein said applying said penalty comprises demoting a  
2 scheduling priority associated with said given task.

1 4. The method of claim 2 wherein said penalty is applied continuously for said  
2 penalty duration.

1 5. The method of claim 2 wherein said penalty is applied during a plurality of  
2 periods over said second predetermined evaluation interval, such that a total  
3 duration of application of said penalty is equivalent to said penalty duration.

1 6. The method of claim 2 wherein said actual usage of said CPU by said given  
2 task in said first predetermined evaluation interval is a first actual usage and said  
3 penalty duration based on said first actual usage is a first penalty duration, said  
4 method further comprising:

5       determining a second actual usage of said CPU by said given task in said  
6       second predetermined evaluation interval;  
7       determining a second penalty duration for said given task based on said  
8       second actual usage and said target CPU usage for said given task; and  
9       applying said penalty to said given task for said second penalty duration  
10      during a third predetermined evaluation interval.

1      7. The method of claim 1 wherein said sub-class is associated with a parent class.

1      8. The method of claim 7 wherein said weight associated with said sub-class  
2      represents a relative share of a target CPU usage associated with said parent  
3      class.

1      9. The method of claim 8 wherein said sub-class is one of a plurality of sub-  
2      classes directly associated with said parent class and said determining said target  
3      CPU usage for said given task comprises:

4           forming a quotient by dividing said weight associated with said sub-class by  
5           a sum of weights associated with said plurality of sub-classes directly  
6           associated with said parent class; and

7           multiplying said target CPU usage associated with said parent class by said  
8           quotient.

1      10. The method of claim 8 wherein said top level class is said parent class of said  
2      sub-class.

1      11. The method of claim 8 wherein a further sub-class of said top level class is said  
2      parent class of said sub-class.

1      12. An apparatus for scheduling usage of a central processing unit (CPU) operable  
2      to:

3           associate a given task with a top level class and a sub-class; and

4       determine a target CPU usage for said given task from a weight associated  
5       with said sub-class and a target CPU usage associated with said top level  
6       class.

1   13. The apparatus of claim 12 further operable to:

2       determine an actual usage of said CPU by said given task in a first  
3       predetermined evaluation interval;

4       determine a penalty duration for said given task based on said actual usage  
5       and said target CPU usage for said given task; and

6       apply a penalty to said given task for said penalty duration during a second  
7       predetermined evaluation interval.

1   14. A computer readable medium containing computer-executable instructions that,  
2   when performed by an apparatus for scheduling usage of a central processing unit  
3   (CPU) in a kernel, cause said apparatus to:

4       associate a given task with a top level class and a sub-class; and

5       determine a target CPU usage for said given task from a weight associated  
6       with said sub-class and a target CPU usage associated with said top level  
7       class.

1   15. The computer readable medium of claim 14 wherein said computer-executable  
2   instructions further cause said apparatus to:

3       determine an actual usage of said CPU by said given task in a first  
4       predetermined evaluation interval;

5       determine a penalty duration for said given task based on said actual usage  
6       and said target CPU usage for said given task; and

7       apply a penalty to said given task for said penalty duration during a second  
8       predetermined evaluation interval.